limited thereto, are considered to be within the scope of the following claims.

WHAT IS CLAIMED IS:

1. A 4-port wavelength selective router comprising four ports (1, 2, 3, 4) with internal signal transmission paths between three port pairs ((1,2), (2,3), (3,4)),

and where in;

when the first optical signal group, Group A, consisting of one or more signals with different wavelengths, and the second optical signal group, Group B, consisting of one or more signals with different wavelengths excluding signals in Group A, propagate bidirectionally,

at port (2) Group A signals are inputted and Group B signals are outputted;

at port (3) Group B signals are inputted and Group A signals are outputted;

between port (2) and (3) only Group A signals are transmitted from port (2) to port (3), and no signals can be transmitted in the other direction;

between port (1) and (2), and port (3) and (4) the Group B signals or both Group A and B signals can

be transmitted, but both Group A and B signals are not transmitted simultaneously through the two port pairs (in other words, between port (1) and (2), and port (3) and (4) at least one port pair transmits only the Group B signals);

between port (1) and (2), and port (3) and (4) optical waves can be transmitted bidirectionally, but at least one port pair transmits the signals in one direction, from port (1) to (2) or from port (3) to (4); and

signals inputted to a specific port (1, 2, 3, 4) cannot be transmitted to more than one port (1, 2, 3, 4) simultaneously.

2. A 4-port wavelength selective router defined in claim 1, where in;

Group B signals are transmitted from Port (1) to Port (2);

Group A signals are transmitted from Port (2) to Port (3);

Group B signals are transmitted from Port (3) to Port (4); and

no signals are transmitted between other port pairs and in the other direction .

3. A 4-port wavelength selective router defined in claim 1, where in;

Group B signals are transmitted from Port (1) to Port (2);

Group B signals are transmitted from Port (2) to Port (1);

Group A signals are transmitted from Port (2) to Port (3);

Group B signals are transmitted from Port (3) to Port (4); and

no signals are transmitted between other port pairs and in the other direction .

4. A 4-port wavelength selective router defined in claim 1, where in;

Group B signals are transmitted from Port (1) to Port (2);

Group A signals are transmitted from Port (2) to Port (3);

Group B signals are transmitted from Port (3) to Port (4);

Group B signals are transmitted from Port (4) to Port (3); and

no signals are transmitted between other port pairs and in the other direction .

5. A 4-port wavelength selective router defined in claim 1, where in;

Group A and B signals are transmitted from Port (1) to Port (2);

Group A signals are transmitted from Port (2) to Port (3);

Group B signals are transmitted from Port (3) to Port (4); and

no signals are transmitted between other port pairs and in the other direction .

6. A 4-port wavelength selective router defined in claim 1, where in;

Group A and B signals are transmitted from Port (1) to Port (2);

Group A signals are transmitted from Port (2) to Port (3);

Group B signals are transmitted from Port (3) to Port (4);

Group B signals are transmitted from Port (4) to Port (3); and

no signals are transmitted between other port pairs and in the other direction .

7. A 4-port wavelength selective router defined in claim 1, where in;

Group B signals are transmitted from Port (1) to Port (2);

Group A signals are transmitted from Port (2) to Port (3);

Group A and B signals are transmitted from Port (3) to Port (4); and

no signals are transmitted between other port pairs and in the other direction .

8. A 4-port wavelength selective router defined in claim 1, where in;

Group B signals are transmitted from Port (1) to Port (2);

Group B signals are transmitted from Port (2) to Port (1);

Group A signals are transmitted from Port (2) to Port (3);

Group A and B signals are transmitted from Port (3) to Port (4); and

no signals are transmitted between other port pairs and in the other direction .

9. A 4-port wavelength selective router defined in

claim 1, where in;

Group B signals are transmitted from Port (1) to Port (2);

Group A signals are transmitted from Port (2) to Port (3);

Group A and B signals are transmitted from Port (3) to Port (4);

Group A and B signals are transmitted from Port (4) to Port (3); and

no signals are transmitted between other port pairs and in the other direction .

10. A 4-port wavelength selective router with four ports (1, 2, 3, 4) comprising;

a first polarization splitting/combining means separating an optical wave into two orthogonally polarized waves, and combining the two orthogonally polarized optical waves into an optical wave;

a first path selection means changing the optical path depending on the polarization and the propagation direction of the optical wave;

a second path selection means changing the optical path depending on the polarization and the propagation direction of the optical wave;

a second polarization splitting/combining means

separating an optical wave into two orthogonally polarized waves, and combining the two orthogonally polarized optical waves into an optical wave;

a first polarization rotation means, located between the first polarization splitting/combining means and the first path selection means, changing two optical waves with parallel polarizations into orthogonally polarized ones or two orthogonally polarized optical waves into ones with parallel polarizations;

a wavelength selective filter (WF), located between the first and second path selection means, selectively passing the optical waves as their wavelengths; and

a second polarization rotation means, located between the second polarization splitting/combining means and the second path selection means, changing two optical waves with parallel polarizations into orthogonally polarized ones or two orthogonally polarized optical waves into ones with parallel polarizations;

and where in;

the first polarization splitting/combining means, the first path selection means, the second polarization splitting/combining means, and the second

path selection means are arranged along the optical wave propagation direction with predetermined spacing.

11. A 4-port wavelength selective router defined in claim 10, where in;

the polarization dividing/combining means comprises the polarization splitters (BC1, BC4) which are arranged so that they cause walk-offs in the same direction for the incident extraordinary waves;

the path selection means comprises the polarization splitter (BC2, BC3) which are arranged so that they cause walk-offs for the incident extraordinary waves in a direction perpendicular to the walk-off direction of the said polarization splitters (BC1, BC4);

the polarization rotation means comprises the reciprocal rotator (RR1, RR2) and the non-reciprocal rotator (FR1, FR2), arranged along the propagation direction of the incident wave, where the reciprocal rotator (RR1, RR2) is composed of two rotators (PAR, NAR) with opposite rotation directions; and

the wavelength selective filter (WC) comprises three filters (WF1, WF2, WF3) which are arranged along the walk-off direction of said the polarization splitter (BC2, BC3).

12. A 4-port wavelength selective router defined in claim 11, where in;

the filter (WF2), located in the middle of the wavelength selective filter (WF; WF1, WF2, WF3), is a optical band pass filter with a pass-band and a stop-band, passes the signals within the pass-band, and blocks the signals within the stop-band;

the other filters (WF1, WF3) are also optical band pass filters with pass-bands and stop-bands and the pass-band and the stop-band of at least one of the two filters (WF1, WF3) should coincide with the stop-band and the pass-band of the said filter (WF2), respectively.

13. A 4-port wavelength selective router defined in claim 11, where in;

the filter (WF2), located in the middle of the wavelength selective filter (WF; WF1, WF2, WF3), is a optical comb filter with periodic pass-bands and stop-bands, passes the signals within the pass-bands, and blocks the signals within the stop-bands;

the other filters (WF1, WF3) are also optical comb filters with pass-bands and a stop-bands and the pass-bands and the stop-bands of at least one of the

two filters (WF1, WF3) should coincide with the stop-bands and the pass-bands of the said filter (WF2), respectively.

14. A 4-port wavelength selective router with four ports (1, 2, 3, 4) comprising;

an optical circulator (Cir) with an input port (a), an output port (c), and a common port (b); and

a wavelength selective coupler (WSC) with two input/output ports (d, f) and a common port (e);

and where in;

the input port (a) of the circulator (Cir)is connected to port (1);

the common port (b) of the circulator (Cir) is connected to port (2);

the output port (c) of the circulator (Cir) is connected to one of the input/output port (d) of the wavelength selective coupler (WSC);

the common port (e) of the wavelength selective coupler (WSC) is connected to port (3); and

the other input/output port (f) of the wavelength selective coupler (WSC) is connected to port (4).

15. A 4-port wavelength selective router with four ports (1, 2, 3, 4) comprising;

two wavelength selective couplers (WSC, WSC1) with two input/output ports ((d, f), (d', f')) and a common port (e, e'); and

two optical isolators (Iso1, Iso2) with an input port (g, g') and an output port (h, h');

and where in;

the input port (g') of the optical isolator (Iso2) is connected to port (1);

the output port (h') of the isolator (Iso2) is connected to one of the input/output port (f') of the wavelength selective coupler (WSC1);

the common port (e') of the wavelength selective coupler (WSC1) is connected to port (2);

the other input/output port (d') is connected to the input port (g) of the other optical isolator (Iso1);

the output port (h) of the isolator (Iso1) is connected to one of the input/output ports (d) of the other wavelength selective coupler (WSC);

the common port (e) of the wavelength selective coupler (WSC) is connected to port (3); and

the other input/output port (f) of the wavelength selective coupler (WSC) is connected to port (4).

16. A 4-port wavelength selective router with four

ports (1, 2, 3, 4) comprising;

two wavelength selective couplers (WSC, WSC1) with two input/output ports ((d, f), (d', f')) and a common port (e, e'); and

two optical isolators (Iso1, Iso2) with an input port (g, g') and an output port (h, h');

and where in;

the input/output port (f') of the wavelength selective coupler (WSC1) is connected to port (1);

the common port (e') of the wavelength selective coupler (WSC1) is connected to port (2);

the input/output port (d') of the wavelength selective coupler (WSC1) is connected to the input port (g) of the optical isolator (Iso1);

the output port (h) of the isolator (Iso1) is connected to port (d) of the wavelength selective coupler (WSC);

the common port (e) of the wavelength selective coupler (WSC) is connected to port (3);

the input/output port (f) of the wavelength selective coupler (WSC) is connected to input port (g') of the other isolator (Iso2); and

the output port (h') of the isolator (Iso2) is connected to port (4).

17. A 4-port wavelength selective router with four ports (1, 2, 3, 4) comprising;

a wavelength selective coupler (WSC1) with two input/output ports (d', f') and a common port (e');

and

an optical circulator (Cir1) with an input port (a'), an output port (c'), and a common port (b');

and where in;

one of the input/output ports (f') of the wavelength selective coupler (WSC1) is connected to port (1);

the common port (e') of the wavelength selective coupler (WSC1) is connected to port (2);

the other input/output port (d') of the wavelength selective coupler (WSC1) is connected to the input port (a') of the optical circulator (Cir1);

the common port (b') of the circulator (Cir1) is connected to port (3); and

the output port (c') of the optical circulator (Cir1) is connected to port (4).

18. A 4-port wavelength selective router defined in one of claim 14 ~ claim 17, where in;

the wavelength selective coupler (WSC, WSC1) is a wavelength-division multiplexer routing two groups of

optical signal in different wavelength bands inputted at the two input/output ports ((d, f), (d', f')) to the common port (e, e'), or routing the optical signals inputted at the common port (e, e') to the two input/output ports ((d, f), (d', f')) as their wavelengths.

19. A 4-port wavelength selective router defined in one of claim 14 ~ claim 17, where in;

the wavelength selective coupler (WSC, WSC1) is a wavelength-interleaver routing two adjacent optical signals inputted at the two input/output ports ((d, f), (d', f')) to the common port (e, e'), or routing the optical signals inputted at the common port (e, e') to the two input/output ports ((d, f), (d', f')).

20. A 4-port wavelength selective router with four ports (1, 2, 3, 4) comprising;

two optical circulators (Cir, Cir1) with an input port (a, a'), an output port (c, c') and an common port (b, b'); and

two optical filters (Fil1, Fil2), with an input port (j, j') and an output port (k, k'), having different pass-band and stop-band;

and where in;

the input port (a) of the circulator (Cir) is connected to port (1);

the common port (b) of the circulator (Cir) is connected to port (2);

the output port (c) of the circulator (Cir) is connected to the input port (j) of the filter (Fil1);

the output port (k) of the filter (Fil1) is connected to the input port (a') of the other circulator (Cir1);

the common port (b') of the circulator (Cir1) is connected to port (3);

the output port (c') of the circulator (Cir1) is connected to the input port (j') of the filter (Fil2); and

the output port (k') of the filter (Fil2) is connected to port (4).

21. A 4-port wavelength selective router defined in claim 20, where in;

the optical filters (Fil1, Fil2) are optical band pass filters passing/blocking the optical signals within the pass-band/stop-band, and the pass-band and the stop-band of one of two the filters (Fil1, Fil2) are opposite to those of the other filter.

22. A 4-port wavelength selective router defined in claim 20, where in;

the optical filters (Fil1, Fil2) are optical comb filters having periodic pass-bands/stop-bands and passing/blocking within the signals within the pass-bands/stop-bands, and the pass-bands and the stop-bands of one of two the filters (Fil1, Fil2) are opposite to those of the other filter.

23. A 4-port wavelength selective router defined in claim 1, where in;

with the connection between the port (1) and port (4), the optical signals propagating from port (2) to port (3) can not be transmitted from port (3) to port (2), and the optical waves propagating from port (3) to port (2) can not be transmitted from port (2) to port (3).

24. A bidirectional add/drop multiplexer, using a 4-port wavelength selective router defined in claim 1, comprising;

a de-multiplexer whose input port is connected to port (4) of the 4-port wavelength selective router defined in claim 1;

a multiplexer whose output port is connected port

(1) of the 4-port wavelength selective router defined in claim 1;

one or more 2 x 2 optical switches (Sw) connected between the output ports of the de-multiplexer and the input ports of the multiplexer;

one or more receivers (RX) connected to one of the ports of the 2 x 2 switches (Sw); and

one or more transmitters (TX) connected to another of the ports of the 2 x 2 switches (Sw).